

## 4.0 KEY FINDINGS

A detailed report of all the responses from every stakeholder can be found in Appendix C. It consists of the site specific information received from the questionnaires and is a summary of immediately available data. It is not a complete account of the known information, which will be thoroughly assessed in subsequent phases of the strategy, as explained in Section 5.0 Future Actions and Recommendations.

### 4.1 Summary of General Information.

The information provided here in Section 4 describes the general issues raised by the stakeholders in respect to each of the four topics. These topics were:

- Archaeological or historical
- Mineralogical
- Biological
- Other issues (aesthetic landscape)

#### 4.1.1 Archaeological

All of the metal mines contain features and structures of archaeological and historical significance, and where known these are recorded on the Regional Sites and Monuments Record that continues to expand as more features are detected. These sites form a significant element of the historic landscape character. There is more to mining archaeology than standing structures. On every one of the sites listed consideration has to be given to surviving earthworks, access to underground features and the potential for subsurface archaeological evidence. Material that acts as the source of contamination, the tailing heaps, is also a part of the archaeological record.

In recognising the importance of individual structures, the assessment of any site is based on its integrity as an industrial landscape, in which the parts contribute to the whole. Of the thirty-six historic landscapes included in the first edition of the Register of Outstanding Landscapes of Historic Interest in Wales (Cadw: Welsh Historic Monuments, Cardiff, 1998) eleven have a strong mining element. Mining is a central feature of the Upland Ceredigion Landscape, with mines like Cwmystwyth being cited as essential elements in the landscape. For this reason it is not always possible to indicate the exact importance of a site simply through a list of individual structures.

In districts such as Gwynedd, some years ago the archaeological trust had assigned a ranking system of importance to both the sites and the features, based on the knowledge amassed during a condensed landscape survey of the district. However subsequent further information, or archaeological discovery, particularly of Prehistoric, Roman or Medieval working, would alter a site's value considerably.

The National Monuments Record for Wales, which is the Royal Commission's public archive, holds a considerable amount of information on metal mines in Wales, derived from Cadw's own studies including fieldwork, and from various other sources. Cadw has funded three of the four Welsh archaeological trusts to undertake assessment projects of metal mines within their areas, completed in recent years.

These have been carried out by Clwyd Powys Archaeological Trust, Dyfed Archaeological Trust and Gwynedd Archaeological Trust, and each final report has provided information identifying the most significant remains of metal mining sites in their area. The Sites and Monuments Records (SMR) held by each of these trusts contains detailed information, and they also hold summary reports on the subject.

This archaeological importance in some cases is statutorily protected as Scheduled Ancient Monuments, and others contain individual Listed Buildings. Such scheduling is the province of Cadw. There is also more that Cadw may soon be considering for scheduling as a result of recent studies undertaken by the regional archaeological trusts of Wales. It is being recognised increasingly that Wales contains some of the most important early mining remains in the UK, and some sites are only gradually becoming better understood.

The Welsh Heritage Assets Survey carried out by Forest Enterprise (FE) also has identified many important mining sites and their archaeological sensitivity on land owned and managed by the FE. There are a number of structures and shafts that require special management. FE have an agreement with the Welsh Archaeological Trusts and any works require their input and recommendations for management. An annual exchange of the SMR data is part of this agreement and each District holds GIS and database information and management plans for each feature.

#### 4.1.2 Mineralogical

There lies significant geological interest at many of the top 50 sites within the spoil tips, exposed open cut rock faces and in the underground workings.

The great majority of sites in the Ceredigion district are located in the Central Wales Ore Field which is often associated with intensive mining activity dating from the Bronze Age times up to the first quarter of the 20th Century.

In such areas, important phases of mineralisation are often clearly visible. Typical mineralisation can include various quartz-sphalerite-galena-chalcopryrite-dolomite breccias together with mineralisation, which often provides most of the ores mined, represented by sphalerite-galena-quartz-calcite-pyrite assemblages.

In 1998 CCW commissioned the National Museums and Galleries of Wales to provide a Welsh database of mine sites (MINESCAN), and produce a full comparative justification of GCR (Geological Conservation Review) and pSSSI's (proposed Sites of Special Scientific Interest), and RIGS (Regionally Important Geological Sites) throughout Wales. This work is presented in four volumes covering the whole of Wales, in addition to a mineralogical database of mines in Wales.

The target list of 50 mines contains 7 Geological Conservation Review (GCR) sites, including both SSSI and proposed SSSI, and 17 proposed Regionally Important Geological/Geomorphological sites (RIGS).

#### 4.1.3 Biological

The spoil tips and rock cuttings often support rare lichen, as well as bryophyte and fern species, which in many cases are unique to these mining habitats. Most of this information for West Wales is available through the West Wales (formerly Dyfed) Wildlife Trust survey (1993).

Many of these top 50 mines, in view of their location may support species of amphibian, reptile, and mammal protected under the provisions of the Wildlife and Countryside Act 1981 (as amended); the EC Habitats and Species Directive (as implemented in Great Britain by Statutory Instrument 2716: The Conservation (Natural Habitats & c) Regulations 1994; and the Badgers Act 1992.

Historical records of bats at sites will relate almost solely to occasional hibernation records. However recent studies have discovered a far more widespread activity known as 'swarming', which occurs from early August into late autumn. At these times many hundreds of bats may visit an underground site at night and leave by morning. Mines can be ideal swarming sites because they often consist of complex network of passages and microclimates that seems to be a feature of good swarming locations. It will therefore be necessary to conduct further bat surveys at the proposed remedial sites at strategic times of the year to fully assess the sites importance for bat communities.

Some areas have been recommended as a candidate Special Area of Conservation (SAC) because they contain habitat types and/or species that are rare or threatened within a European context. Amendments to candidate SACs can also be considered based upon further habitat or species considerations. Examples of habitats and/or species for which mine areas have previously been recommended as a candidate SAC include Blanket Bogs, Calamarian Grasslands, European Dry Heaths and Luronium natans (floating water plantain).

A SSSI citation describes the special interests for which the site was notified in the British context. The interests for which the site was selected as SSSI may differ from the interests selected in a European context.

#### 4.1.4 Other

The significance of individual sites is recognised by the protection of Scheduled Ancient Monument and Listed Building designations at individual sites. However, the mines are also important as significant features in the cultural or historic landscape. Much of the upland area of Ceredigion in which many are located has been designated as Historic Landscape on the basis of features such as the mining landscape features including the wide-spread remains of water power systems, transport routes, and settlements, as well as mine workings, buildings and extraction waste. Many of these mines are also located in the Cambrian Mountains Environmentally Sensitive Area.

Many of the mines are of great scenic and industrial-archaeological interest and in these changing times, with greater interest in tourism and themed interests in the countryside, are likely to become increasingly appreciated and used.

Several stakeholders have commented on the use of sites for a wide variety of educational and tourism activities on a more or less informal basis. The sites, however, have a potential for use by more general interest tourist beyond their use by the more obvious mining interest and activity

users. As described above, the sites have great potential, not just for their individual features, but also for their group value, as a significant part of the historic landscape of Ceredigion.

A number of sub-groups of mines can be recognised as having significant landscape value taken together as a group e.g. Level Fawr, Pontrhydygroes; Darren-Cwmsymlog-Cwmerfyn; west Pumlumon Massif; etc. These have great potential as a focus for educational and tourist opportunities in the county.

Most of the sites are located in areas of great landscape interest, with footpaths, cycle tracks and other features of a developing rural tourism infrastructure. A number of promoted ways cross the main mining areas, and the mine sites have obviously been noted in promotional literature for their historical and landscape value.

#### 4.2 Stakeholder Comments Regarding Remediation

Respondents to the questionnaire were provided with the following list of commonly used environmental remediation techniques:

- Redistribution of waste spoil;
- Capping of waste spoil to prevent exposure to the atmosphere;
- Installation of perimeter cut-off drains to prevent water infiltration;
- Culvert or divert surface water away from contaminated land;
- Line stream bed with clay to prevent contact with contaminate material;
- Increase the size of natural marsh land areas providing natural water treatment;
- Create new anaerobic wetland treatment areas to reduce metal levels;
- Construction of a semi-passive operational treatment plant on site.

Stakeholders were then asked if and how these proposed techniques could have an impact. In many cases the stakeholder also made recommendations on the best approach to safeguard the interests they represent from being damaged. Below describes the general issues raised by the stakeholders in respect to each of the four topics. These topics were:

- Archaeological or historical
- Mineralogical
- Biological
- Other issues (aesthetic landscape)

##### 4.2.1 Archaeological

Any remedial work could have an impact on the archaeological remains at a site, not only on features and structures visible on the surface but also sub-surface remains covered by later surface layers and underground features. Also in many instances the preservation of underground access is also considered desirable.

It is important to retain all those contributory features, from tailing heaps to chapels, in a landscape which has an important role in the economic regeneration of an area increasingly reliant on the tourist industry as a source of income.

Therefore, it is recommended that no such work should be undertaken without a prior archaeological assessment being carried out for all sites.

At sites of particular archaeological importance or significance RCAHMS would recommend that an archaeological watching brief be carried out during any remedial work.

In general the remediation works indicated may have significant effects on archaeological interests where these exist. For example, the re-distribution of spoil or capping of tips may hide evidence for the phasing of mining over many centuries or may lead to the loss of individual features. Installation of drains may cut through archaeological stratigraphy, or otherwise disturb features of importance. Set against this is the fact that the conservation of metal mine sites, which have usually been abandoned for several generations, is of concern to Cadw. Several important sites are suffering from natural decay, which in some cases is accelerating.

Where sites are Scheduled, Scheduled Ancient Monument Consent from the National Assembly for Wales will be required for any works within the identified areas. Outside these Scheduled Areas there may be other features of importance which should also be taken into consideration in any proposed works and protected where possible - many of the metal mines sites have exceptionally extensive physical remains, including open cast workings from early exploration, areas of tips, and linear watercourses which may run for several miles. In some cases, there may be grounds for sites not yet Scheduled to be considered for Scheduling.

It may be advisable to commission an archaeological assessment to determine the sensitivity of sites where there are known remains. Welsh Office Circular 60/96 Planning and the Historic Environment: Archaeology gives advice on the National Assembly's policy in considering Scheduled Monument Consent applications (paras 5-12) and on the assessment and preservation of archaeological remains, whether scheduled or not (paras 8-24).

In a few cases there may be other ancient monuments in the vicinity of mine sites which are not connected with mining. If works are proposed outside the mine sites themselves, then the Agency may need to consult Cadw separately on each of these.

The Welsh Mines Society and Preservation Trust will require very detailed and specific information about the Agency's interests in each site and the way in which the Agency intend to mitigate any impact upon the cultural heritage. Archaeological assessments or evaluation work will be required where the integrity of the surviving surface or sub-surface archaeology is endangered by the proposed works with great preference given to the preservation of all archaeological deposits in-situ.

There should also be visits to each potential scheme area in the company of a development control archaeologist from each of the four Welsh Archaeological Trusts and an Agency representative so that issues can be discussed on-site well in advance of proposals being formalised.

Detailed consultation and planning is essential to reduce potential damage to both archaeology and landscape

whilst addressing concerns over waterborne pollution. The final designs should seek to ensure the protection of significant archaeological remains and their settings.

However, there will be instances where resolving environmental hazards can be beneficial to a site's development. One example is Parys Mountain to which many of its development objectives concern conservation and research issues. Thus the local Amlwch Industrial Heritage Trust are naturally anxious that any necessary remediation of drainage takes this into account. The Trust notes that the drainage system is a prime asset in terms of national (and even international) research, but also in a way that could be compatible with cleaning up the Afon Goch.

#### 4.2.2 Mineralogical

For sites designated or proposed as SSSI or RIGS, any removal, redistribution or recapping of these designated areas would severely compromise the geological interest.

Also prior consent will be required at any site for activities that can significantly alter the geological character of a site. Such activities include:

- Modification to the structure of water courses including rivers, streams, springs, ditches, drains, including their banks and beds, as by re-alignment, regrading, damming or dredging;
- In-filling or digging of ditches, drains, ponds, pools, marshes, quarries or pits;
- Destruction, construction, removal, re-routing, or regrading of roads, tracks, walls, fences, hardstands, banks, ditches or other earthworks, including soil and rock exposures;
- Modification of natural or man-made features and clearance of boulders, large stones, loose rock or scree and the battering, buttressing or grading of geological exposures and cuttings (rock and soil).

#### 4.2.3 Biological

In regard to each of the eight suggested remediation techniques the biological impacts are set out in Table 2.

Therefore, it is recommended that protected species and sites with any significant biological interests are subject to a survey using recommended techniques at an appropriate time of year using specialist consultants. It is only when this information is available that the likely impacts of the proposed scheme on protected species and biological interests can be fully assessed.

On completion of the surveys identified above, and subject to the legal status of individual species present, the final remedial design should include appropriate conservation and reasonable avoidance measures.

If the proposed mines are considered likely to support populations of European Protected Species, such as the Great Crested Newt, operations may only proceed after an appropriate licence has been issued by the Welsh Assembly Government. This licence can only be issued for the purposes of preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature, and beneficial consequences of primary importance for the environment. Furthermore, the licence can only be issued by NAW on condition that there is no satisfactory

alternative, and the development will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.

In order for CCW to assess whether the works would have a negative impact on the favourable conservation status of bats, it will be necessary for background information to be provided in the form of survey information and any monitoring data. If there is no recent survey information, CCW would expect that to be undertaken before a licence application could be considered. CCW would also expect to see a method statement outlining:

- The work to be undertaken;
- The possible effects of this on the bats/bat roost and;
- How the work will be undertaken to minimise effects on the bats/bat roost and;
- Any other mitigation works for the benefit of the bat interest at the site.

#### 4.2.4 Other

In instances where the spoil and shafts lie within Forest Enterprise land, any works would involve clearance of trees, even if just for access. From a landscape and woodland point of view there would need to be in depth consultation with Forest Enterprise. Of course any alteration to current forest management plans will require a Forest Design Plan amendment submitted via Forest Enterprise for approval by the Forestry Commission.

Should any remediation works be required and planned, full consultation with Forest Enterprise will be required at an early stage. This will also allow for early consultation with the local population.

With 38 of the Agency's 50 priority sites within Ceredigion the Local Authority sees the Metal Mine Strategy as an opportunity to improve on the previous approach to site identification, and the design and implementation of schemes. The authority are aware that early remediation

schemes, whilst successful in their primary objectives, did not take proper regard for the historical, archaeological and nature conservation aspects of the sites.

A major criticism of early reclamation schemes is that they were designed almost exclusively as civil engineering projects, with a monolithic approach to the site using large-scale material movement and hard engineering solutions. In many cases the design of the project has been extended from limited areas of acute concern (e.g. eroding tailings tips) to areas of the site of relatively little pollution potential (e.g. stable waste rock tips, workings, standing structures). The projects have used a limited hard landscaping palette, replacing diverse habitats and landscape features with areas of uniform improved pasture grasses and concrete features. This style of reclamation of spoil tips often produces a curiously ugly and sterile-looking landscape (as at the Goginan mine, the west part of Cwmsymlog), which can look much less well integrated with the local landscape than the original workings.

The authority would support the use of a more subtle approach to the management of the sites. Since the early schemes the value of the individual features and the sites as a whole has gained greater recognition, and this should be reflected in the design of schemes. A general starting point would be to aim for minimum intervention in the sites necessary for the remediation of the acute problems of contamination. At the same time options could be considered for appropriate work on consolidation of features, and interpretation and safety works where required. In general, Ceredigion Council would support the use of more varied solutions to the problems posed by mine sites.

An important aspect of the management of the sites should be close attention to the implementation of the schemes. Archaeological and other features on mines sites are relatively fragile and are easily damaged by operations during remediation. This emphasises the need for intelligent design with regard to the site features and for close control of operation of the works.

**Table 2 Biological Impacts from Potential Remediation Techniques**

Technique	Potential Impact
Redistribution waste spoil.	Waste spoil is known to support scarce metallophyte liverworts and mosses, lichens and other rare lower plants may be present that could be destroyed if waste is moved, as well as result in loss of habitat.
Capping of waste spoil to prevent exposure to the atmosphere.	As above.
Installation of perimeter cut-off drains to prevent water infiltration.	Data is incomplete regarding wetland species - not known.
Culvert or divert surface water away from aging areas of spoil.	May impact on bryophytes, otters and flight paths of bats. Could also reduce the for-habitat for these animals.
Line stream bed with clay to prevent contact with contaminate material.	May destroy invertebrate and bryophyte habitat.
Increase the size of natural marsh land areas providing natural water treatment.	Could enhance/increase wetland areas - potentially positive impact.
Create new anaerobic wetland treatment areas to reduce metal levels.	Could increase bat foraging areas and create new habitat for invertebrates.
Construction of a semi-passive operational treatment plant on site.	Depending on its siting location may destroy important semi-natural habitat e.g. Woodland. But could also have a positive impact for insectivorous species.

### 4.3 Data Interpretation

The interpretation of the information provided by various stakeholders was facilitated by defining mine groups, examining previous WDA ranking study and producing a stakeholder matrix summarising their involvement in each of the 50 priority mine sites.

### 4.3.1 Mine Groups

During the analysis of the collected data it became apparent that the top 50 list of mines could be sub-divided into five groups. These are presented in presented in Table 3. An alphabetical list of the mines and their associated group is presented in Table 4.

**Table 3 Metal Mine Site Groups**

Group	Interpretation
1	No diverging issues - It appears that there are no diverging issues at this site, the Agency could therefore pursue the remediation relatively easily, but still taking into account intrinsic historic interests and still requiring a complete desk study and scope of works and possible impacts.
2	Converging issues - It appears that the Agency and one or more stakeholders have a shared interest in the remediation of the site and therefore it may be possible to develop a collaborative project. For example, there could be a combined interest to install a water clean-up scheme at the same time as the development of the site as a tourist attraction or the water remediation scheme could be extended to address issues of public health and safety.
3A	Diverging issues - It appears that the Agency and the views of one or more stakeholders diverge at this site, however, it is considered that the differences could be resolved subject to careful negotiations and sympathetic design.
3B	Diverging issues - It appears that the Agency and the views of one or more stakeholders diverge at this site, it is considered that the differences are so great that it would be extremely difficult to progress any remediation scheme. For example sites extensively designated as SSSI.
4	Further information - During the review of data it appears that these sites may not be presenting such an impact to the water environment as previously understood or data on sites outside the top 50 has come to light that indicates that they should be included within the top 50. Further monitoring and data review required.

**Table 4 Mines and Groupings**

MINE NAME	GROUPING	MINE NAME	GROUPING
ABBEY CONSOLS	3A	GROGWYNION	3B
ABERDAUNANT	4	GWYNFYNYDD	4
ALLTYCRIB	3A	HAFAN	3A
BOG	2	HENFWLCH	3A
BRONFLOYD	3A	LEVEL FAWR	3A
BRYNYRAFR	4	LLANFAIR	1
BWLCHGWYN	3B	LLANFYRNACH	3A
CAEGYNON	2	LLWYNTEIFY	3B
CASTELL	3A	LLYWERNOG	2
CWM RHEIDOL	3A	LOGAULAS	3A
CWMSYMLOG	3A	MYNYDDGORDDU	4
CWMYSTWYTH	3B	MINERA	2
CYSTANOG	4	NANTYCREIAU	3B
DAREN	3A	NANTYMWYN	4
DOLAUCOTHI (OGOFAU)	4	PARC	4
DYFNGWM	4	PARYS	2
DYLIFE	3B	PENRHIW	3A
ESGAIRFFRAITH	3B	PENYCEFNI	4
ESGAIRLLE	2	POWELL'S	3A
ESGAIRMWYN OLD	4	RHEIDOL UNITED (ERWTOMAU)	3A
FRONGOCH	3A	RHEIDOL UNITED (GWAITH GOCH)	3A
GEIRIONYDD MINE	4	TEMPLE	3A
GLOGFAWR	3A	TY'N-Y-FRON	3A
GOGINAN	2	WEMYSS	3A
GRAIGGOCH	3A	YSTUMTUEN	3A

### 4.3.2 WDA Ranking

During the consultation process it became evident that the Welsh Development Agency had previously conducted its own ranking study of metal mines in Wales. To appreciate this ranking study in the context of this strategy it is important to consider the following related issues:

- (i) The study was carried out in 1978 and embodies the views of that time.
- (ii) The study gives a broad combined score of 5 environmental impacts namely:
  - Physical features
  - Amenity/Landscape
  - Environmental Pollution of Land
  - Environmental Pollution of Water
  - Spoil

If mine sites that have undergone treatment since this 1978 survey were re-ranked by the WDA today then obviously the rankings presented here would change. This is particularly so because the WDA has funded work at seven of the top ten sites as ranked in the WDA survey.

One further point to be noted is that within the WDA survey, sites which appeared environmentally benign but which posed physical hazards, by way of open and unprotected shafts or dangerous structures, were separately logged.

The study commissioned by the WDA produced large amounts of valuable site specific data. The Agency would like to thank the WDA for making this data available where it is envisaged that it will be used in the consideration of site specific issues as the strategy is implemented.

### 4.3.3 Stakeholder Matrix

Table 5, Stakeholder Site Matrix, provides a summary of which stakeholder responded at each site. A further two columns to the far right of the table also list the Agency mine group and WDA rank.

It is important to note that certain stakeholders indicated an interest in all the mine sites. The interpretation of the data in this strategy will be used to identify sites that can be taken forward to remediation in a constructive and collaborative manner. The data collected in no way removes the need for detailed desk study, site investigation and survey work before remedial schemes are progressed.

### 4.4 Summary of Mine Groups

By classifying the top 50 sites into these five groups it is possible to determine which sites may be progressed through to remediation more expediently than others by identifying site constraints and possible joint interests at sites at an early stage.

In summary a total of 31 out of the 50 mine sites fall within Groups 1, 2 or 3A, that is those sites where it is considered that there are: no diverging issues (Group 1); converging issues (Group 2); and sites with diverging issues, but resolution possible (Group 3A). This means that further remediation can now be considered at the majority of top 50 sites.

However, of those that are not currently suitable, seven are considered to have diverging issues so complex (Group 3B) that at present it is not considered viable to progress any

plans for a remediation scheme. While the remaining twelve sites will first require further environmental impact assessment (Group 4) before a complete understanding of the degree of impact these sites are having on the environment.

The distribution of the sites into the sub-groups is illustrated in Table 6. The largest proportion consists of sites in group 3A. These being sites which, although including some diverging issues, still have potential for site remediation subject to site specific issues being resolved. While of the remaining eight sites without diverging issues, seven have converging issues and one is considered relatively easy to remediate (but taking account of intrinsic historic interests and still requiring a complete desk study and scope of works and possible impacts).

**Table 5 Stakeholder Site Matrix**  
*see page 21*

**Table 6 Distribution of Sites by Group**

Group	No. of Sites	% of Total	Colour Code used in Table 5
1	1	2	
2	7	14	
3A	23	46	
3B	7	14	
4	12	24	

